

breaking off the small seal'd neck of the Bubble (without at all stirring the sights, object, or glass) and admitting the external Air, you will find your self unable to see the utmost ends of the object; but the terminating rayes A E and A D (which were before refracted to G and F by the rarified Air) will proceed almost directly to I and H; which alteration of the rayes (seeing there is no other alteration made in the Organ by which the Experiment is tryed, save only the admission, or exclusion of the condens'd Air) must necessarily be caused by the variation of the *medium* contain'd in the Glass B; the greatest difficulty in the making of which Experiment, is from the uneven surfaces of the bubble, which will represent an uneven image of the object.

Now, that there is such a difference of the upper and under parts of the Air, is clear enough evinc'd from the late improvement of the *Torricellian* Experiment, which has been tryed at the tops and feet of Mountains; and may be further illustrated, and inquired into, by a means, which some whiles since I thought of, and us'd, for the finding by what degrees the Air passes from such a degree of Density to such a degree of Rarity. And another, for the finding what pressure was requisite to make it pass from such a degree of Rarefaction to a determinate Density: Which Experiments, because they may be useful to illustrate the present Inquiry, I shall briefly describe.

Fig. 3.

I took then a small Glass-pipe A B, about the bigness of a Swans quill, and about four foot long, which was very equally drawn, so that, as far as I could perceive, no one part was bigger then another: This Tube (being open at both ends) I fitted into another small Tube D E, that had a small bore just big enough to contain the small Pipe, and this was seal'd up at one, and open at the other, end; about which open end I fastned a small wooden box C with cement, so that filling the bigger Tube, and part of the box, with Quicksilver, I could thrust the smaller Tube into it, till it were all covered with the Quicksilver: Having thus done, I fastned my bigger Tube against the side of a wall, that it might stand the steadier, and plunging the small Tube cleer under the *Mercury* in the box, I stopt the upper end of it very fast with cement, then lifting up the small Tube, I drew it up by a small pully, and a string that I had fastned to the top of the Room, and found the height of the *Mercurial Cylinder* to be about twenty nine inches.

Then letting down the Tube again, I opened the top, and then thrust down the small Tube, till I perceived the Quicksilver to rise within it to a mark that I had plac'd just an inch from the top; and immediately clapping on a small peice of cement that I had kept warm, I with a hot Iron seal'd up the top very fast, then letting it cool (that both the cement might grow hard, and more especially, that the Air might come to its temper, natural for the Day I try'd the Experiment in) I observ'd diligently, and found the included Air to be exactly an Inch.

Here you are to take notice, that after the Air is seal'd up, the top of the Tube is not to be elevated above the superficies of the Quicksilver in

in the box, till the surface of that within the Tube be level with the Quicksilver (as I have elsewhere prov'd) being equal to the Glass then the Air, will not naturally rise in the small Pipe, as the superficies of the *Mercury* in the box, you are to observe, how much below the outward superficies of the *Mercury* in the box, that of the same in the Tube does top being open, free ingress is admitted to the outward.

Having thus done, I permitted the *Cylinder*, or small Tube, to rise, till I found the surface of the Quicksilver to be two inches above that in the box, and found the Air to rise in it self but one sixteenth part of an inch; then drawing the pipe, till I found the height of the Quicksilver within to be two inches above that without, I observed the Air to be expanded more then it was at first, and to take up the room of the raised Tube till the *Cylinder* was six inches high, to take up $1\frac{1}{2}$ inches of room in the Pipe; then the expansion of the Air that I found to each of which I set down in the following Table; where the first height of the *Mercurial Cylinder*; the next, the expansion of the Air; the third, the pressure of the *Atmosphere*, or the height of the *Mercury*, which was then near thirty inches; The last of the Air so expanded, which is found by subtracting the numbers out of the third; for having found, that the Air then keep up the Quicksilver to thirty inches, look how much height is wanting must be attributed to the Elater of the Air. And therefore having the Expansion in the second row, and the subjacent *Cylinder* of *Mercury* in the first, and the height of the *Cylinder* of *Mercury*, which of it self counterbalances the pressure of the *Atmosphere*; by subtracting the numbers out of the numbers of the third, you will have the measure of the Air so deprest, and consequently the force of the Air in its expansions, registred.

29	02	31
18	02	19
10	02	11
6	02	7
4	02	5
3	02	4
2	02	3
1	02	2
0	02	1